

Although running to *O. ovalis* Adams, these specimens differ particularly by reason of the double length of the second compared with the third costal sections of the wings, and by the rather unusual appearance of an almost bristly front.

***Oscinis dissidens* n. sp.**

Texas,—Plano, Collin county; June, 1907, one specimen taken in an experiment cage in oat field. Type deposited in the U. S. National Museum.

Mostly shining black; face below the frontal triangle, together with the oral region and mouthparts, excepting the palpi, venter of abdomen largely and dorsal base obscurely, knees of anterior and middle legs slightly, tibiæ of middle legs obscurely, all trochanters and the tarsi except at tip, and halteres, yellowish. Frontal triangle extending across the vertex, polished, reaching two-thirds of the distance to the antennæ, adjoining outer edges of front dull, front projecting over the antennal insertions. Antennæ dull opaque, third joint inwardly sericeous, arista pale and faintly pubescent. Mesonotum with faint pale pubescence, two fine sulci running forward from posterior margin, scutellum with a pair of small terminal bristles.

Wings clear, first and second costal sections equal in length, third and fourth longitudinal veins parallel. Length scarcely more than 1 mm.

Runs to, and agrees in many respects with *O. obscura* according to Mr. Coquillett's description, but the following distinguishing features are noted: greater part of the front yellow, tibiæ of fore legs black instead of yellow, and the second longitudinal vein joins the costa at more than half the distance instead of midway between the apices of the first and third longitudinal veins.

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## Notes on the Psychodidae.

By LEONARD HASEMAN, University of Missouri.

Since the completion of my monograph of the North American Psychodidæ, which appeared in the Transactions of the American Entomological Society, Vol. XXXIII, I have been carefully watching for any new species and life histories which may turn up in this region.

The extreme minuteness and inconspicuousness of the adults, as well as the immature stages of these flies, makes their discovery in nature possible only by very close and persistent ob-

servations. While I have secured a number of my species on shaded windows and vine-clad walls of buildings, I have had far better results collecting the adults at night when they are readily attracted to lights. I have secured all my life histories by preparing vegetable cultures, in which they breed in great numbers. The past year two new life histories have been found, one of which proves to be that of a new species. A number of specimens collected between March 20 and June 20 have been identified as *Ps. schizura* Kin. Their wing length varies from 1.8 mm. to 2.8 mm., and they all have the black tufts at the tip of the veins and the alternate black and white markings which give the wings a mottled appearance. A few specimens collected between April 18 and May 24 have been identified as *Ps. cinera* Bks. This species has also been found fairly common in the caves of Indiana by Mr. A. M. Banta,\* so that it probably appears over the entire range from the Atlantic to the Pacific.

Early in the spring of 1907 I collected a quantity of dry weeds and grass, and also some green grass and curly-dock leaves, which were put into two large square glass jars, covered with water and placed in the insectary to thoroughly ferment. In a short time mosquitoes appropriated the jars for their use. The adults and larvæ of the mosquitoes were collected and destroyed, and glass covers placed over the jars for a time. Later the covers were removed and early in June adult Psychodids were found in one of the jars. The cover was replaced on this jar and a large brood of adults appeared on the 13th of June. This jar was fairly teeming with them, while the other, which stood by its side, contained none at all. The first brood of larvæ and pupæ escaped my observation, but on the 15th of July a second brood of larvæ appeared, when the jar was removed to my laboratory and daily observations made on the habits of the larvæ, pupæ and adults. After the first adults were found in the jar, it was kept covered except when specimens were being removed. In this way five broods were reared during the summer. The adults of the first brood appearing June 13-20, the second July 17-20, the third August 8-12, the

\* Carnegie Institute of Washington, publication No. 67, p. 84.

fourth August 20-27, and the fifth September 10-15. The broods gradually decreased in numbers of individuals until there were very few to appear in the last brood. The food supply began to get scarce after the second brood, and decaying potatoes were added, for which the larvæ showed great fondness.

The second jar, containing the decaying vegetable culture, was left standing uncovered in the insectary all summer. The mosquitoes did not return to it and no signs of Psychodids appeared in it. The water nearly all evaporated, so that by the first of December only a small quantity of water remained in the bottom to keep the grass and weeds moist.

While rearranging the insect breeding cages on December 9, I was surprised on lifting up the jar containing the culture to see a half dozen or so adult Psychodids fly out of it. The jar was immediately covered and removed to my laboratory. On the following day a few more adults emerged, but by the most careful examination no larvæ or pupæ could be found. A number of the adults were collected and mounted, while the rest were left in the jar for breeding. The second brood of larvæ and pupæ appeared during Christmas vacation when I was away and on my return the 5th of January, a great many adults were present in the jar. Some of the adults were again collected and others left for breeding. On the 6th and 7th of January the first signs of larvæ were noted. They had just hatched and were extremely small, and unlike the larvæ of the other species I have observed, were very sluggish. The first pupæ from this brood of larvæ were found on the 15th of January and adults began to emerge on the 16th. Only three broods of this Psychodid were reared; the adults appearing Dec. — to Dec. 9; Dec. — to Jan. 6; Jan. 16 to 25. Stragglers from the last brood continued to appear until the middle of February and a few specimens again appeared the last of March.

Returning to the first species, which was bred between June 15 and Sept. 15, I find, on comparing it with *Ps. floridica*\*

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\*Trans. Amer. Ent. Soc., Vol. xxxiii, pp. 316 and 324.

that a close relation exists between the two forms. My material of *Ps. floridica* has deteriorated considerably, especially the larvæ and adults, so that comparisons in some particular details are made with considerable difficulty.

There is a very marked difference in the size of the Missouri and Florida specimens, the larvæ of the latter being from one-fourth to one-third larger. The difference in size also appears in the pupæ and adults. The Florida larvæ have eight or nine dorsal plates on the posterior annuli of the abdominal segments, while the Missouri larvæ have but six. The Florida larvæ have no ventral thoracic plates, while the Missouri ones have two small widely separated plates on the posterior annulus of each segment. Each of these plates bears two long bristling hairs. In the living Missouri larvæ the internal organs show through the body wall as a broad creamy-white band in the region of the fourth and fifth abdominal segments, which did not appear in the Florida larvæ. These slight but uniformly constant differences convince me that this Missouri Psychodid is not the same as the Florida one, though certainly very closely related. The adults have been compared with *Ps. nocturnalæ* and their similarity in every respect is so great that I feel sure they are the same species. The dates of their appearance also correspond.

I find that my figures of *Ps. floridica* are slightly at fault on the segmentation of the posterior end of the abdomen. In some cases I find that the break between the last two annuli is so marked that I mistook it for a segmental rather than an annular division.

#### LARVA.

The larva is quite slender, cylindrical, measuring 11 mm. in length and .8 mm. in breadth. Each of the three thoracic segments is rather distinctly divided into two annuli. The first abdominal segment also has two annuli, while each of the other six abdominal segments has three. Each annulus of the two posterior abdominal segments has, on its dorsal surface, a small chitinous shield; the third shield of each segment being

the largest. Each of the abdominal and thoracic annuli are well armed with short, closely set spike-like hairs, which are more or less arranged in girdles, due to the annular divisions. Besides these short hairs there are two or four longer curved hairs on the dorsal surface of the posterior annulus of each segment, likewise one or two along the sides of the same annuli, and two pairs of similar hairs on their ventral surface. The paired ventral hairs on the thoracic segments are mounted upon small, widely separated, circular plates, similar to the dorsal plates on the posterior annuli except much smaller.

In living specimens the internal organs in the region of the fourth and fifth abdominal segment show creamy-white through the body wall. This did not appear in the Florida larvæ and is also obsolete in alcoholic specimens. No signs of anal tracheal gills are present. The thoracic air nipples are present on the dorso-lateral portion of the second prothoracic annulus. As in the case of the Florida specimens, these were not seen to be used by the larvæ for breathing.

The larvæ have the greedy habit of engulfing everything that they can get hold of. The alimentary canal is continually distended with food. The internal organs appear very distinctly through the body-wall, especially in case of specimens preserved in alcohol. The protrusions surrounding the anal opening are much more pronounced than in the Florida specimens. A test was made to determine the length of time they could live under water without coming to the top to breathe and the limit was found to be about twenty-four hours, as in the case of the Florida larvæ.

#### PUPA.

The pupæ are found hidden in the debris at the surface of the water, where they are continually kept moist and where they can protrude their thoracic breathing tubes out above the surface. The pupæ are somewhat larger than those from Florida and the abdominal spines are slightly less developed. There is a very marked difference in the size of the male and female pupæ. The latter are both longer and more heavily built. In-

cluding the thoracic breathing tubes, which are quite long and slender, the female pupæ are 4 mm. in length and .85 mm. in breadth.

The spines along the sides of the pupæ are inconspicuous, usually ending in a fine bristle-like hair. On the ventral surface the first abdominal segment behind the tips of the wing sheaths has but a single row of spines. Along the median line are three or four small spines, bordered on each side by one

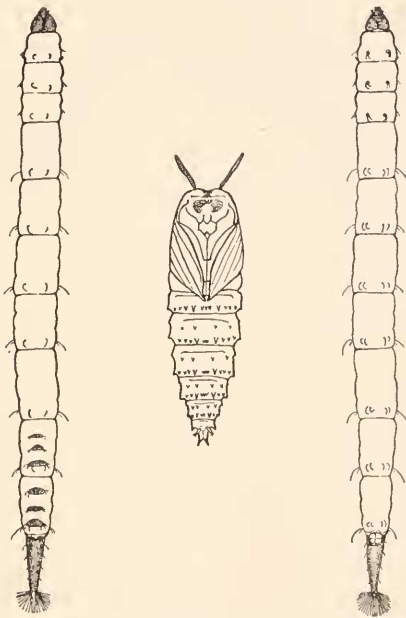


FIG. 1.—Dorsal and ventral view of larva and ventral view of pupa,  
*Ps. nocturnalata* (X 20).

large spine and these in turn by three or four smaller ones, which extend out to the lateral edge of the body. The next four abdominal segments each have two rows of spines. The anterior row on each segment consists of four medium-sized spines, well separated and placed at equal intervals. In the middle of the second row on each segment are three small, closely-set spines, which are bordered on each side by one large



spine and these in turn by three or four spines, which decrease in size laterally. The posterior abdominal segment, viewed from the ventral side, has a basal portion, from the lateral sides of which projects a single strong spine, and from the ventral surface of which project two strong spikes, each of which terminates in two sharp spines. Posteriorly the segment is much constricted and terminates in two pointed spines with a narrow emargination between. Looking at the segment from the side, it can be seen that the dorsal half projects beyond the ventral portion and terminates in two very strong dorsally curved spines.

On the dorsal surface the segments have but a single row of spines. Along the median line of the back the first segment bearing spines has two small closely applied ones, the next two segments each have three and the next two segments each two. Lateral to these closely joined spines on each segment there is one strong spine, followed by three or four smaller ones. On the dorsal surface of the anterior abdominal and the thoracic segments there is usually a single papillæ bearing a fine bristle-like hair.

The dorsal spines curve slightly forward, while those on the ventral surface project backward. These help the pupæ in working their way up through the decaying vegetable material and in maintaining their position when they once get to the surface where their thoracic breathing tubes can be protruded out into the air.

The breathing tubes are very long and slender, with a short, much wrinkled stalk. The trachea can be traced to the very tip of the tube. There are two rows of small, circular foramina on the dorsal surface of each breathing tube. These foramina also surround the tip of the tube and extend some ways down the ventral surface in two rows.

In some cases the segments of the antennæ can be distinguished through the semi-transparent sheath. The ocelli can be seen through the sheath and are arranged in parallel rows extending almost at right angles to the longitudinal direction of the body. Some of the venation of the wings and the seg-

mentation of the tarsi can be distinguished through their sheaths.

Careful observations on the habits of the adults were made. They were often seen to settle upon the surface of the decaying material in the jar as if feeding, but I was unable to decide definitely concerning this; they may have been depositing eggs, as they were usually the large females.

The act of copulation was observed in a number of instances, and a few notes on these observations may be of interest to other entomologists. The males precede the females by a day or two and are very active by the time the females begin to emerge. Mating takes place soon after the females emerge and while they are yet quite sluggish. I have watched the males courting the females by taking a position immediately in front of them, where they remain perfectly motionless for several minutes, except for the continued waving of the antennæ, which are occasionally allowed to touch the antennæ of the female. When the males attempt copulation, they protrude the posterior end of the abdomen forward, much as the small Hymenopterous parasites do when they deposit eggs in plant lice, except that the abdomen is directed forward along the side of the body rather than directly underneath it. After the strong fang shaped male genitalia have firmly grasped the female, the insects turn end to end and have been seen to remain in coition for from one to two minutes. While in coition the wings stand roof-like, the male's being enclosed by the female's, much as in the case of butterflies.

Returning to the second Psychodid which was reared between December 9th and January 25th. This species differs very much from the other Psychodids I have observed. The larvæ are much shorter than the other forms and are broader than deep. The annulation is very distinct. The pupæ are short and plump, slightly broader than deep. The adult has been carefully compared with my other species, and as it does not conform to the descriptions of any of Bank's and Kincaid's species, I have decided that it is a new species.



## LARVA.

The larvæ are extremely sluggish and have the habit of rolling themselves up in the decaying material and feigning death when disturbed. They are not nearly so greedy as the other forms, though they feed almost continuously. Occasionally they leave the culture and climb up along the sides of the vessel by carrying along with them a film of water. Specimens have often escaped from my watch-glasses and crawled about on the table until quite dry, but on replacing them in the glasses they would revive.

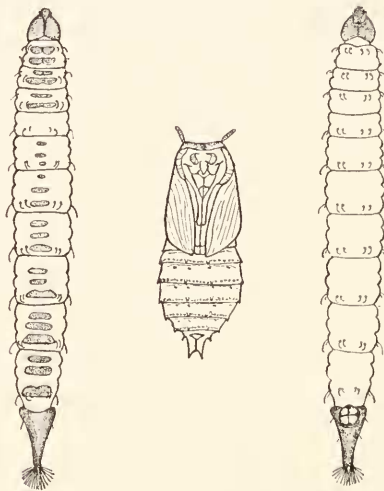


FIG. 2.—Dorsal and ventral view of larvae and ventral view of pupa, *Ps. domestica*, n. sp. (X, 20).

The larvæ attain a length of from 6 to 7 mm. and a breadth of .8 mm., and are slightly flattened. The thoracic segments and the first abdominal have each two distinct annuli, while the next six abdominal segments have each three. Each annulus, with the exception of those of the first abdominal segment, bears a distinct plate on its dorsal surface. There is some variation in the dorsal plates on the first three abdominal segments, and they are usually much reduced, though, as a rule, each annulus of the second and third segment bears a small

plate, and often the anterior annulus of the first segment also bears a plate.

The plates at the posterior and anterior ends of the body are much the larger. The first and usually the second prothoracic and first mesothoracic plates are so cleft from behind along the median line as to form two plates placed side by side. Besides these dorsal plates the body is well armed with very short bristling hairs and a few long ones. The posterior annulus of each abdominal segment bears two pairs of long bristling hairs on its dorsal and ventral surfaces and one or more similar hairs on its lateral margin. The anterior annulus of the thoracic segments bears similar hairs. These hairs are mounted upon low papillæ and are usually curved rather than straight. One or both pairs on the dorsal surface of the posterior segments may be mounted upon the dorsal plates.

The larvæ possess the prothoracic air nipples, as in the other forms. So far as I have been able to determine, these are never used for respiration, unless perhaps when the larvæ leave the water and crawl up the sides of the jar or along on the straws and weeds which extend above the water. At this time they have only a thin film of water around them and the four small projections bearing the cilia which protect the posterior breathing pores are usually retracted so that these breathing pores are closed and at such times air may be taken through the thoracic air nipples.

While feeding and while in the water respiration is carried on entirely through the posterior spiracles. It is interesting to watch this operation. After the larva has been at the bottom of the jar feeding for a while, a small bubble of gas will begin to form at the tip of the breathing tube. This is continued until the bubble has reached a considerable size, when the larva stops feeding, lets go all hold, and rises to the surface much as an aeronaut. On reaching the surface the bubble bursts, the cilia around the spiracles spread out and hold the larva in place until a new supply is drawn into the tracheal system, when the cilia are retracted and the weight of the body of the larva carries it to the bottom of the jar again, where it continues to feed. The fresh air in the tracheal system is

under considerable pressure, so that the supply is not able to float the larva, but as soon as the pressure is released and the gas collects in a bubble at the tip of the tube, its buoyancy is sufficient to carry the larva to the surface. This operation is repeated every five minutes or so, depending upon the activity of the larva.

A test was made to determine the length of time the larvæ could remain submerged. For this purpose a small quantity of kerosene was poured over the water in a small dish and many of the larvæ were found to be still active after being deprived of air for a day.

#### PUPA.

The pupæ are oval in shape and somewhat flattened. They attain a length of 3.5 mm. and a breadth of .8 mm. The thoracic breathing tubes are much shorter than in the other forms, measuring about .25 mm. in length. The abdominal segments are well armed with numerous short, simple and compound spines. On the ventral surface the five segments posterior to the tip of the wing sheaths each has two rows of these spines. The first row on each segment is near its anterior edge and consists of four compound spines, well separated. The second row is near the posterior edge of the segment and consists of from six to nine small compound spines along the median line, bordered laterally by a single enlarged spine, and this followed laterally by a number of smaller ones. The compound spines consist of two or three small sharp spines borne on a low circular papilla. The posterior segment bears on its ventral surface a single strong compound spine, along the lateral edge of its slightly expanded base, while the tip is terminated by two slightly diverging strong simple spines with a broad emargination between.

The arrangement of the spines on the dorsal surface is about the same as on the ventral surface. Each segment has two rows, but the spines of the second row are smaller and more closely set than on the ventral surface. Six of the abdominal segments bear these rows of spines on their dorsal surface,

while only five of them have spines on the ventral surface. The ventral surface of the first segment bearing dorsal spines is hidden by the tip of the wing sheaths. The dorsal portion of the last segment is curved dorsally and ends in two very strong spines. On the dorsal surface of the last segment near the base there are two laterally projecting spines as on the ventral surface.

The breathing tubes are club-shaped, with a short, much wrinkled stalk, and bear two longitudinal rows of foramina along their dorsal surface. The segmentation of the antennæ shows distinctly through their semi-transparent sheath.

***Psychoda domestica* n. sp.**

Body dark brown to black, clothed with long black hair, which to the unaided eye gives the insect a distinct blackish appearance. Thorax lighter than abdomen, and in some specimens the hair has a brownish cast. Legs black with black hairs and scales, the latter on the hind tarsi brownish. Wings long, rather acutely rounded at the tip of second simple nervure; evenly and well clothed with long black hair; posterior fringe black, about one-half the breadth of wing; anterior fringe much narrower; dense tuft of long black hair on base of costa. Anterior furcation one-sixth length of wing nearer tip than posterior; slightly beyond middle of wing. Female wing, length 2.25 mm. to 3.25 mm.; breadth, .75 mm. to 1.00 mm. Male, length, 1.8 mm. to 1.85 mm.; breadth, .65 mm. to .7 mm. Length of antennæ about one and one-half breadth of wing; 16-jointed; 1, slightly longer than broad; 2, spherical; 3-13, with basal enlargements and terminal pedicles, which are slightly swollen in the middle; 14-16, much reduced and closely applied to 13 and to each other; 3-16, with dense whorls of smoky-black hairs; 1-2, with shorter hairs and scales. Male genitalia strongly developed; superior pair about as strong as inferior; two-jointed; basal quite strong, slightly longer than broad; second twice as long as first, slightly expanded at base, weaker distally where it terminates in a very acute claw; inferior genitalia one-jointed, greatly expanded at base, but tapers rapidly to tip, which bears a single long, strong papilla about one-half the length of the segment. Ovipositor and ventral plate yellowish brown; ventral plate broader than long, with broad emargination behind reaching half way to base; ovipositor as long as breadth of plate, much curved; plate and base of ovipositor armed with short hair.

*Habitat*:—Columbia, Missouri; bred in laboratory from December 9th to March 20th.